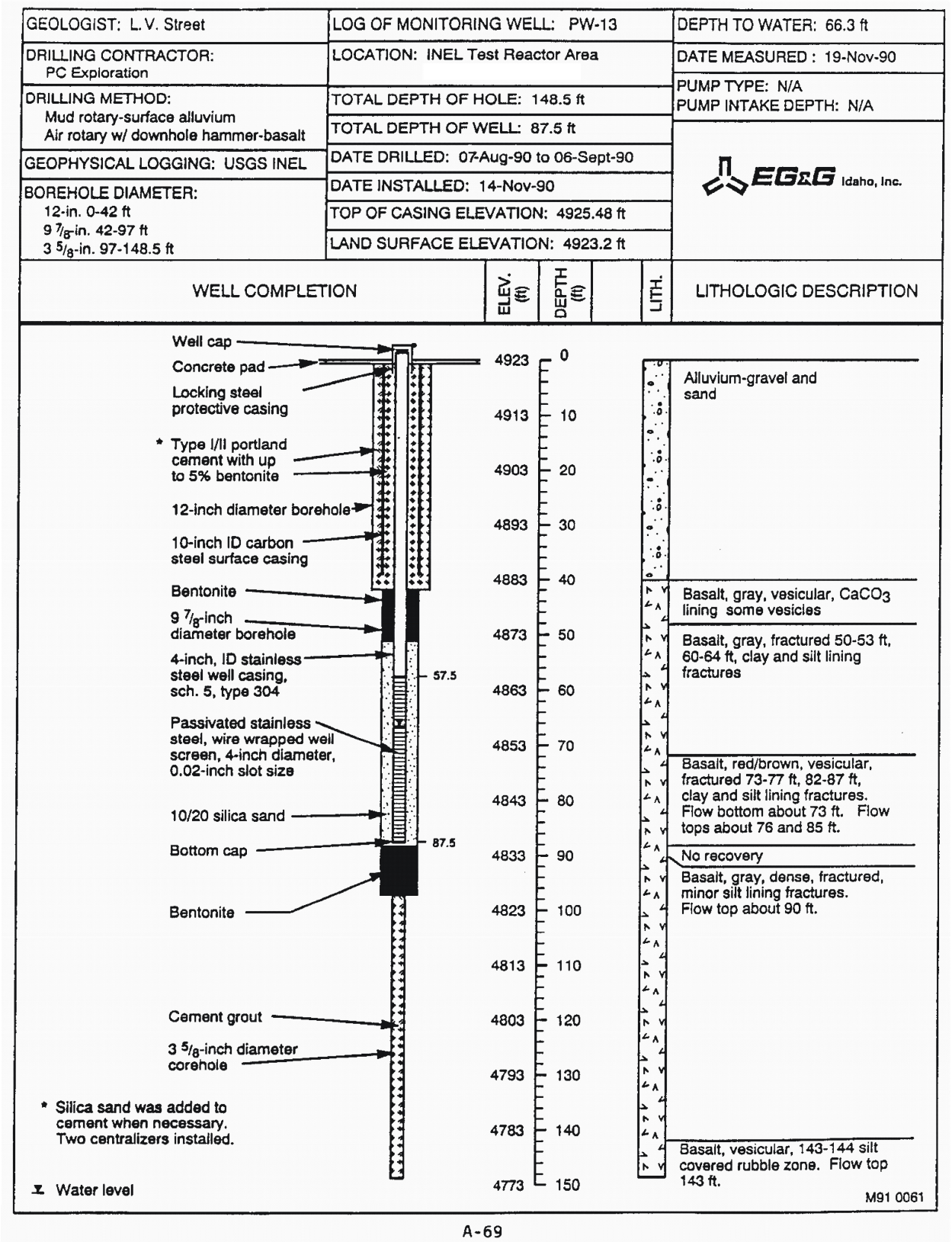

Figure 11. Well completion diagram and lithology of the Test Reactor Area Perched-Water Well PW-13.

of diesel recovery in the core hole progressively decreased to a trace amount or thin film (van Deusen 1990; EG&G Idaho 1991a). When well construction was initiated on November 14, no diesel was noted in the core hole. Diesel was not noted during well development on January 9, 1991 (see footnote c).

Water level and diesel thickness in Well PW-13 were measured six times between December 1990 and April 1997, with no discovery of free product. The next measurement in November 1999 reported a 1.03-ft layer of floating diesel. Thickness of the floating diesel increased to 1.37 ft in February 2000, and then it began decreasing. No free product was measured in August 2000. A diesel thickness of 0.11 ft was measured in September 2000, but none was found in November 2000. Measurements made since June 2001 have indicated a continued presence of diesel until April 2004. Measurements made during this investigation have recorded diesel thicknesses of 3.3 ft and 1.2 ft in December 2003; in January 2004, 3.07 ft of diesel was measured. A measurement of the diesel thickness in April 2004 indicated that no measurable thickness was present in the well. However, Well PW-13 was sampled in March 2004 and the diesel may not have had sufficient time to accumulate in the well. A thickness of 2.98 ft was measured in the well in March prior to sampling; no further measurements were made until April 2004. Figure 12 shows the history of diesel thicknesses in PW-13.

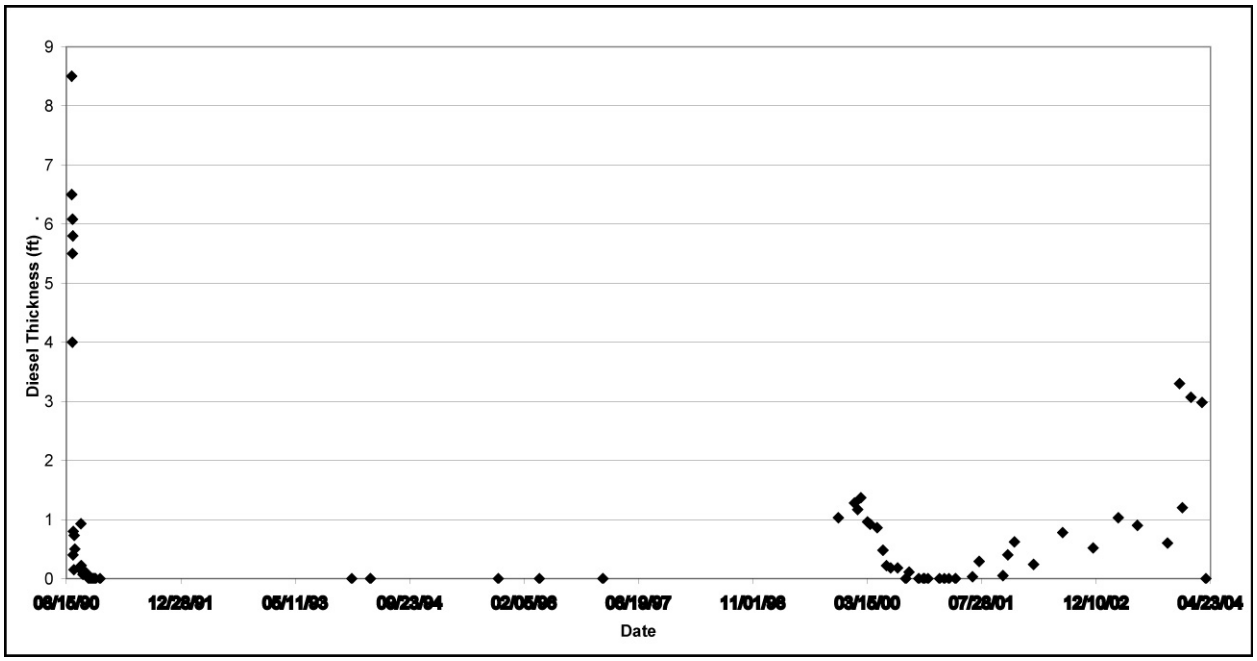

Figure 12. Measured free-phase diesel thickness in Well PW-13.

Well PW-13 is not a routinely sampled monitoring well and analytical data for the well are limited. Sampling of the water phase at PW-13 first occurred in 1990, shortly after the initial discovery of free-phase product. Initial samples collected from PW-13 in 1990 did not contain detectable concentrations of the aromatic hydrocarbon compounds benzene, ethylbenzene, or toluene, which are common constituents of diesel fuel. Ethylbenzene was found at a concentration of 5.41 µg/L in 1993, but had decreased to nondetectable concentrations by April 1994. Four samples collected in October 1995 contained ethylbenzene at concentrations ranging from 0 to 3.6 µg/L. The most recent previous samples, collected in June 2001, did not contain detectable concentrations of ethylbenzene. Benzene has only been detected once in Well PW-13. One of the four samples collected in June 2001 contained a concentration of 0.6 µg/L, while the remaining three samples did not contain detectable concentrations of benzene. The concentration of 0.6 µg/L (J flag) is near the reporting limit for the contaminant. Benzene has not been detected in previously collected samples or in subsequent samples.

Xylene (total), another common constituent of diesel fuel, was found at a concentration of 31,000 µg/L during the 1990 sampling (Johnson 1990). The relatively high xylene concentration seems to be anomalous when compared to the apparent absence of benzene, ethylbenzene, and toluene, also in 1990. This seemingly anomalous data point is unvalidated and unqualified. Subsequent samples collected in 1993 and 1995 did not contain detectable concentrations of xylene. Samples collected in November 2000 detected a concentration of 1 µg/L. The data were J flagged and are considered an estimate because of the uncertainty near the reporting limit. In June 2001, one of four samples measured 2 µg/L of xylene.

Sampling at Well PW-13 has shown the presence of diesel-range organics, also referred to as total petroleum hydrocarbons/diesel. Both sampling events since 1990 have indicated the presence of diesel-range organics. A May 2001 sample contained a concentration of 72,000 µg/L (J flagged for exceeding hold time). Samples collected in June 2001 contained concentrations of 7,300 µg/L and 83,000 µg/L. Gasoline-range organics, also referred to as total petroleum hydrocarbons/gasoline, were also collected during sampling. Analytical results from a May 2001 sample showed a concentration of 43,000 µg/L. The June 2001 sample indicated concentrations of 10,000 and 21,000 µg/L. With the limited number of samples collected, no clear conclusion can be determined as to an overall increase or decrease of the concentration of the contaminants.

3.2.3 Probable Diesel Source

A review of historical documents suggests that the source of the diesel in Well PW-13 is a 2-in. diesel transfer line (TRA-57). As shown in Figure 10, TRA-57 ran from the TRA-727 and TRA-775 storage tanks to the TRA-643, TRA-648, and TRA-656 ETR buildings (INEEL 2002). The fuel line was installed in the late 1950s and abandoned in the early 1980s. Two possible leaks may have occurred, one in 1980 and another in 1981. Both are documented in the *Preliminary Scoping Track 2 Summary Report for the Test Reactor Area Operable Unit 2-04: Fuel Spills* (Sherwood et al. 1994). The 1981 diesel spill also is documented in *Track 1 Sites: Guidance for Assessing Low Probability Hazard Sites at the INEEL, Site Description: Abandoned Buried Diesel Fuel Line from TRA-727 and TRA-775 to ETR, Site ID: TRA-57* (INEEL 2002). The latter report provides information that was not included in the abovementioned Preliminary Scoping Track 2 Summary Report (Sherwood et al. 1994). The information in the cited reports is not entirely consistent with respect to the dates and resolution of the leaks. The 1980 and 1981 leaks are discussed separately below.

3.2.3.1 1980 Leak. Information regarding a possible 1980 leak is conflicting. The *Environmental Characterization Report for the Test Reactor Area* (EG&G Idaho 1991a) stated that the line was replaced from TRA-605 to the turn between the Materials Test Reactor (MTR) (TRA-635 building) and ETR (TRA-643 building) because of leaks (Figure 10). No estimation of volume or information concerning removal or discovery of contaminated soil around the reported excavation was reported. Information located in the Preliminary Scoping Track 2 Summary Report (Sherwood et al. 1994) also indicated that the potential leak simply may have been a discrepancy between the utilities usage and the storage tank levels, indicating that there may not have actually been a leak. Discussion captured in meeting notes with one participant having direct knowledge of operations during the timeframe of the 1980 leak did not recall any excavations in 1980, but did remember activities associated with the leak documented in 1981 (Sherwood et al. 1994).

3.2.3.2 1981 Leak. The 1981 leak occurred at an elbow in the 2-in. fuel transfer line 60 ft northeast of Well PW-13 (see Figure 10). The leak was discovered when the day tank, located in the TRA-648 building, supplying the ETR generator would not fill with the transfer pumps operating at full capacity. The day tank was excavated and inspected, and it was found not to have leaked. The fuel line was then spliced into a nearby abandoned 1.5-in. carbon steel steam line (INEEL 2002). The abandoned line is

located adjacent to the fuel transfer line. The cross-connection is visible on one end inside the TRA-648 building and is believed that the other cross-connection is underground approximately 328 ft east of TRA-648 (INEEL 2002). In December 1990, a tracer tight test was conducted on the reconfigured fuel line (INEEL 2002). The test did not reveal any leaks in the fuel line. Based upon pumping rates, the elapsed time, and the capacity of the transfer pipe, the volume of diesel fuel released prior to the repair was estimated at 2,000 gal (Sherwood et al. 1994). This volume included potential storage remaining within the old transfer line itself. It should be noted that the volume of the reconfigured line is slightly less than that used during the original calculation as a result of the 1/2-in. decrease in diameter of the pipeline. Further, it should be noted that approximately 328 ft of the 2-in. carbon steel fuel transfer line was abandoned in place (INEEL 2002). Based upon the proximity of the known 1981 release site to PW-13 and the lack of alternative sources, it is believed that the diesel in PW-13 is the result of the 1981 leak. Use of the fuel line was ceased in 1990; neither the original line nor the additional portions of the reconfigured line are in use. The lines are flanged on both ends.

3.2.3.3 Other Possible Sources. Five diesel tanks were associated with the TRA-57 diesel line, three source tanks (i.e., TRA-727C, TRA-727D, and TRA-775), and two destination tanks (INEEL 2002). The destination tanks, TRA-21 and TRA-22, were located on the north side of the TRA-643 building (Figure 10) and on the west side of TRA-648 (Figure 10), respectively. Both destination tanks were removed in the early 1990s (INEL 1993a, 1993b). The line also provided fuel to heaters located in the TRA-656 building. Neither tank showed signs of leakage, although the ETR tank did have some contaminated soil removed from the excavation (INEL 1993a, 1993b). Soil beneath the ETR tanks was field screened and any soil above 50 ppm was removed for disposal. Once field screening levels were below 50 ppm, samples were collected and the excavation was backfilled with clean soil. Approximately 5 yd^3 of soil was removed and disposed of at the Central Facilities Area landfill. Samples indicated low levels of total petroleum hydrocarbons in two of the six samples collected (10 ppm, 100 ppm). Four of the six samples collected contained low levels of toluene: 0.3 ppm in one sample and 0.2 ppm in the four other samples. It is unlikely that these tanks contributed to the source of diesel detected in Well PW-13. Both tanks were reviewed by the EPA and the Idaho Department of Environmental Quality (DEQ) and were determined to be no action sites. Despite the minor contamination found beneath the ETR tank, it is unlikely that it had any influence upon the free-phase diesel in PW-13. Despite the contamination present beneath the tank, the integrity of the tank was good and no leaks or damage were noted.

Further research did not reveal another possible point of origin for the diesel fuel found in PW-13. Utility maps do not show any other nearby transfer lines, and the only fuel tanks known to be in the immediate area have been removed. Fuel tanks currently in use are at the north end of the facility, over 1,800 ft away from PW-13. The tanks also are downgradient of PW-13 and the diesel release site, in terms of the overall geometry of the perched water (Figure 13). Note that the contour intervals in Figure 13 are irregular; intervals are irregular for the purpose of easier viewing. No spills of significant quantities have been reported in the area of PW-13. Based upon the proximity of the known 1981 release site to PW-13 and the lack of alternative sources, it is believed that the diesel in PW-13 is the result of the 1981 leak.

3.3 Well Installation

This section documents the drilling and installation of the TRA-1933 and TRA-1934 perched-water wells. These two wells were installed to provide additional information regarding diesel in the vicinity of Well PW-13. Information in this section was compiled from the *End of Well Report for TRA-1933 and TRA-1934* (ICP 2004a).